

These four volumes of painstaking work, including more than 1400 pages and 174 plates, would alone have constituted a most important contribution to natural knowledge, reflecting high honour upon the author; but this is only a part of the work which he accomplished. He had a lively interest in deep-sea exploration, and, as a member of the commission, took a prominent part in the dredgings of the *Talisman* expedition in the year 1883. The results of this and of the *Travailleur* work were made known in his "La Vie au fond des Mers" in 1885. Another work published about this time is the "Faune des Crustacés de la Nouvelle-Zélande," and his "Zoologie Descriptive" was issued in the same year. In 1893 he published, in conjunction with M. Grandidier, "Observations relatives aux ossements d'Hippopotames trouvés dans le Marais d'Ambolisatra à Madagascar" (*Ann. Sci. Nat. Zoologie*, 1893, ser. vii. vol. xvi., pp. 151-190, pls. 7-15). In this memoir are described the remains of the remarkable pigmy hippopotamus found by M. Grandidier, from which place also Dr. Forsyth Major obtained the material recently described by him in the *Geological Magazine*.

Besides the examples of Dr. Filhol's labours above alluded to, he made many other contributions to zoology and palæontology. Under his name will be found, in the Royal Society's catalogue, upwards of fifty papers published before the year 1883, and about as many more have been published since that date. This noble record has been appreciated by his fellow workers throughout the world, and has not been without hearty recognition in his own country; for besides the Lalande-Guérineau prize in 1876, already mentioned, he was awarded the gold medal of the Scientific Congress of the Sorbonne in 1879, the chief prize for physical and natural science of the Academy of Sciences; he was the recipient of the Petit-d'Hormoy prize in 1883, and received the decoration of the Legion of Honour in 1886.

Dr. H. Filhol at one time held the chair of zoology of the Faculty of Sciences of Toulouse, his native town; in 1885 he became subdirector, and subsequently director, of the laboratory of anatomical zoology at the Museum of Natural History, Paris; more recently he was appointed to the professorship of comparative anatomy at the same national institution, and continued to hold that post until the time of his death.

NOTES.

THE German Emperor has, with the consent of the British Government, appointed Sir Joseph Dalton Hooker, G.C.S.I., C.B., late Director of the Royal Botanic Gardens at Kew, a foreign Knight of the Order *Pour le Mérite* for Science and Arts. It has been officially decided that the regulations regarding foreign decorations do not apply to this order.

LORD RAYLEIGH has been elected a corresponding member of the section of natural sciences of the Imperial Academy of Sciences of Vienna.

MR. J. B. SCRIVENOR has been appointed geologist on the Geological Survey, and Mr. D. A. MacAlister has been appointed temporarily to investigate metalliferous mines.

WE learn that Lord Salisbury has asked the President of the Board of Trade to receive a deputation from the Institution of Electrical Engineers on the subject of the present unfavourable condition of the law relating to electric lighting and traction (see *NATURE*, vol. lxi. p. 35). The deputation is to wait on Mr. Gerald Balfour to-day (Thursday). In view of the backwardness of this country in electrical engineering and of the large degree in which this backwardness is due to restrictive legislation, it is to be hoped that the Government may be induced to introduce more rational laws without delay.

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THE Berlin correspondent of the *Times* writes that experiments were carried out last year at the General Telegraph Office in Berlin with a new system of octoplex typographic telegraphy. It is claimed that this system will enable twenty operators to send 18,000 words an hour through a single wire. The despatching instrument is of the typewriter form, and to telegraph any letter it is only necessary to depress a single key. The receiving instrument prints the message on a sheet of paper (not on a tape), and this can be immediately detached and forwarded to its proper destination. An installation to enable communication between Hamburg and Frankfurt by this system is being put up, and will shortly come into use. Further particulars and developments will be awaited with interest. The invention is due to the late Prof. H. A. Rowland, of Baltimore.

It is reported that Mr. Thomas A. Edison has been experimenting with a view to the invention of a storage battery to enable automobiles to run 100 miles without recharging. As soon as a 5000 miles endurance test, which is about to be started, is completed, he will begin the manufacture of storage batteries for the use of automobiles, launches and street cars. It is understood that Mr. Edison's invention will also greatly diminish the weight of automobiles.

THE fifty-first annual meeting of the American Association for the Advancement of Science will be held at Pittsburgh from June 28 to July 3. At the first general session the retiring president, Dr. C. S. Minot, will introduce the president-elect, Prof. Asaph Hall. The presidents of sections will deliver their addresses on Monday, June 30, and Dr. Minot will give his address, as retiring president, on the following day, at the Carnegie Museum. The programme of the work of the sections has not yet been published.

THE forty-seventh annual exhibition of the Royal Photographic Society will be held from September 29 to November 4. There will be five sections, namely, (1) selected pictorial photographs; (2) general professional work; (3) photographic apparatus and materials; (4) photo-mechanical processes of reproduction; (5) scientific photography and photography in its technical applications. The judges of sections four and five will be Sir William Abney, K.C.B., F.R.S., Mr. Chapman Jones and Mr. E. Sanger Shepherd.

THE *Bulletin* of the Belgian Academy contains an obituary notice by M. C. Le Paige of M. François Deruyts, who died in February last. M. Deruyts was an ardent student of pure geometry. On leaving the University he published a remarkable dissertation on the theory of involution and unicursal homography, and this formed the nucleus for a series of investigations dealing with the geometry of hyperspaces and the determination of the singular elements in an involution of any order. From general theorems, numerous elegant applications to special curves and surfaces were deduced. M. Deruyts also possessed an intimate knowledge of analysis and mechanics.

AN International Shipbuilding Congress in connection with the Düsseldorf Exhibition was opened on Monday by the Crown Prince of Germany. More than 550 delegates are in attendance. Of foreign countries Great Britain is most numerous represented. The Institution of Naval Architects is represented by the Earl of Glasgow (president), Lord Brassey, Messrs. Elgar, Thornycroft, Yarrow, and others. The Crown Prince, in declaring the Congress open, expressed the regret of his father, the Emperor, that his Majesty was unable to be present, and hoped that the deliberations of the Congress would be fruitful in good results.

THE Board of Agriculture has given notice that the Colorado beetle has again made its appearance at Tilbury. Potato growers are, therefore, requested to examine their plants and

to send to the Board without delay for identification specimens of any insects suspected to be the Colorado beetle. The Board will be pleased to supply copies of a leaflet, with a coloured illustration of the beetle, post free and free of charge upon application. Letters or packets containing specimens, and applications for leaflets, should be addressed to the Secretary, Board of Agriculture, 4 Whitehall Place, London, S.W., and need not be stamped.

AN interesting ceremony was performed at Chamounix on May 19, M. Joseph Valat, the founder of the Roches-Rouges Observatory, being in the chair. The bust of Charles Durier, a former president of the French Alpine Club, was presented to M. Simon, the manager, by M. Schrader, the president of the society. A letter was read from M. Janssen, who was prevented by reasons of health from being present. M. Simon was surrounded by a group formed by the Mont Blanc guides, who ascend Mont Blanc every week in order to bring back to Chamounix the automatic readings registered at the Janssen Observatory. Speeches were delivered by MM. Chautemps, the member for Chamounix to the Chambre des Députés, Morel, Fredel, president of the Mont Blanc section of the Alpine Club, Paul Joanne, an intimate friend of Charles Durier, Pridoux of the Academy of Sciences, and other influential members of the Alpine Club.

AT the recent general meeting of the Paris Geographical Society, the following prizes awarded for this year were announced:—The chief gold medal of the Society to Captain Joalland, for the Joalland-Meynier expedition to Central Africa, with a silver-gilt reproduction of the medal to Captain Meynier. The Herbet-Fournet prize, a gold medal and 6000 francs, to Governor Emile Gentil, for work on the Tchad (1895-1901). Silver medals are awarded to the principal officers of M. Gentil's expedition. The Ducros-Aubert prize, three gold medals, to M. V. A. Bernard and Dr. Huot, for the Chari-Sangha exploration, and to M. Ch. Perdrizet, for his work in West Africa. The Conrad Malte-Brun prize, gold medal, to Captain Ch.-Lemaire, for the scientific exploration of Katanga. The Henri Duveyrier prize, gold medal, to Captain E. A. Lenfant, for scientific explorations on the Senegal and Niger. The Louis Bourbonnaud prize, gold medal, to M. P. Bons d'Anty, for explorations in South China. The Jean-Baptiste Morot prize, gold medal, to Captain E. Julien, for explorations in the basin of the Oubanghi. The Léon Dewez prize, gold medal, to M. Hugues Krafft, for his journey into Russian Turkestan. The Pierre-Félix Fournier prize, special medal and 1300 francs, to M. H. Béraldi, for his book "Cent Ans aux Pyrénées." Silver gilt medal of the Society to MM. Marcel Dubois and Auguste Terrier, for their book "Un Siècle d'expansion coloniale." The Alphonse de Montherot prize, silver medal, to M. Georges Brousseau, for his explorations on the Congo. The Charles Grad prize, two silver medals, to M. Maurice Superville and Lieut. Bos, for their exploration of the Kotto. The Alexandre Boutroux prize, silver medal, to M. Albert Lesieur, for his explorations on the French Congo. The J. C. Janssen prize, silver medal, to M. Emile Belloc, for his study of the physical geography of the Pyrenees. The William Huber prize, silver medal, to M. de Martonne, for his geographical studies. The Jomard prize to M. Cl. Madrolle, for his book "Histoire de la Compagnie des Indes en Chine." Competitive prizes of the Society, two silver medals, each accompanied with 400 francs, to MM. P. Pasquier and M. A. Breschin.

ON Thursday evening last the members of the Camera Club and their guests were assembled to listen to a discourse by Dr. E. F. Grün on the new fluid lens with which he has recently been obtaining some very excellent photographs of theatrical

and other night scenes. The use of a fluid lens is a very old idea, but it soon fell out of use when homogeneous glass could be made properly and the combination of flint and crown successfully mated. The object of using fluid in lenses at this early time was simply to overcome certain optical deficiencies of the single glass lens. Dr. Grün's idea in adopting this form of lens is to increase very considerably the rapidity of its action, and so successful has he been that he can produce very excellent photographs with short exposures with ordinary night illumination, his lenses working at $f. 1.4$ and even $f. 0.5$. The slides made from the photographs he has taken showed several snapshots taken at different theatres without any previous preparation either as regards the actors and actresses, or the stage illumination, and these were quite sufficient to give one an idea of the important future for such a lens. One of the chief points in the lens is the great depth of focus which is shown in the individual pictures, for not only are the performers in front of the stage in focus, but the scenery at the back is quite sharp as well. The very great rapidity of the lens led Dr. Grün to attempt to take kinematograph pictures of stage performances. The results, although not of a very high order, showed, however, that with a little more experiment just as good pictures of night scenes can be secured as are displayed to-day in kinematograph pictures taken in daylight. There is little doubt that Dr. Grün has indicated the great possibilities of his new lens, and many scenes which could not be depicted on account of their apparent lack of sufficiently brilliant illumination may now be caught in the meshes of this photographic net.

WITH reference to the correspondence which has recently been appearing in these columns on the misuse of coal, we see from last week's *Electrical Review* that a company has just been incorporated in America for the commercial fixation of nitrogen. The company is to erect a factory at Niagara, where it already has one commercial unit in operation. This consists of a chamber about 10 feet high, through which cool dry air is passed. The air is subjected to the influence of electric discharge in the form of small-current high tension arcs, whereby oxides of nitrogen are formed. These oxides are led to an absorption tower, where they are brought into contact with a suitable compound of a substance of which the nitrate is desired; caustic soda or potash, for example, are used for the preparation of sodium and potassium nitrate respectively. If led into water, nitric acid can be obtained. It is said that part of the object of Lord Kelvin's recent visit to the States was to see the working of the process, and that he was greatly interested and much impressed by its success.

IN a short note contributed to the *Atti dei Lincei*, xi. 9, Signor G. Celoria urges the desirability of including the teaching of astronomy in the curriculum of every Italian university and of making the subject a compulsory part of the science courses. At present the regulations require astronomical classes to be held at all universities which possess an observatory, but Signor Celoria considers that much useful teaching may be given without the help of instruments, and further, that the present limitation tends to confine the study of astronomy to its purely practical aspect.

IN the University of Colorado *Studies*, Messrs. William Duane and Charles A. Lory describe a simple electric thermostat for keeping the temperature of a bath constant to within a thousandth of a degree Centigrade for a considerable time. The heat is supplied by an electric current, which in the case of a conducting liquid flows through the liquid itself, and in the case of a non-conducting fluid flows through wires suspended in the bath. A system of tubes containing a liquid with a large temperature coefficient of expansion is placed in the bath, and by means of a suitable mechanism the expansion of this liquid

interrupts or reduces the strength of the heating current when the required temperature has been reached. It might be thought that this arrangement would give rise to considerable fluctuations of temperature with the making and breaking of the current, but it is found that the makes and breaks follow each other so rapidly, often two, three or even more times in a second, that the variations cannot be detected with a differential thermometer which ought to be sensitive to within a two-thousandth part of a degree.

In the *Revue générale des Sciences* of April 30, M. Nordmann proposes a theory of the propagation of electric force from the sun into space which is based on the assumption that Hertzian waves are emitted from the surface of our luminary, and that the emission of these electric waves must be particularly intense at epochs of maximum solar activity. M. Nordmann admits that hitherto attempts to discover Hertzian waves in the solar radiation have led to a negative result; but, in his opinion, this may be explained by the copious absorption of the electric undulations in the higher layers of our atmosphere. On this hypothetical basis the theory attempts an explanation of cometary phenomena, of terrestrial magnetism, and of the luminosity of matter in the nebulae and in the vicinity of temporary stars. M. Nordmann's paper thus covers the same ground as the previous researches of Prof. Arrhenius. But the distinguished Swedish physicist advocates the theory of corpuscular electric emission, and M. Nordmann endeavours to show that some grave objection may be urged against this point of view, and that, on the whole, the cosmical phenomena here considered are better explained by the undulatory electric theory of Maxwell and Hertz.

MESSRS. ROSENBERG AND CO. have submitted to us for examination a portable Röntgen ray outfit which they have produced. The outfit consists of a 10-inch spark coil of special construction with tube, holder, fluorescence and accessories, the whole fitted in a strong box measuring 2 feet 1 inch \times 11 inches \times 14 inches. The coil when tested with a 12-volt accumulator sparked well at 10½ inches—the distance between the discharging pillars. The break has large platinum points, and the sparking can be regulated with great nicety. For those who prefer an electrolytic break there is a means of throwing out the condenser, and other breaks can be used with little alteration. We should advise those who wish to use this apparatus continuously to have a separate tube-holder, as that supplied with the outfit is fixed to the box, and consequently would render the operator liable to "X-ray dermatitis." The screen is thickly and evenly coated, and measures 7 \times 10 inches. One advantage of this outfit is that when the box is locked everything is safe, as all attachments are covered up and cannot possibly be damaged. There is ample room inside for plates, volt- and am-meters, and the box contains all that is required except the accumulator. As being trustworthy, cheap and handy, the outfit can be recommended for the purpose for which it is intended, and those who have not made a special study of X-ray work will find little difficulty in obtaining good results with it.

A DISCUSSION of the rainfall of Saxony and the Thuringian provinces, with coloured map, by Dr. G. Hellmann, has been published on the same plan as that adopted for several of the other German States which have preceded it. The work is based upon the results of ten years' observations, and forms a valuable contribution to the rainfall statistics of that part of Europe. The mean annual rainfall for the whole area is rather more than 23 inches, but in the neighbourhood of the Hartz Mountains to the west and the Thuringian forests to the south, the annual fall exceeds double that amount; in the central

parts of the province of Saxony the rainfall does not exceed 20 inches. The discussion gives full details of the monthly values and of the greatest fall in various short intervals of time.

THE Royal Meteorological Society has published a fifth edition of "Hints to Meteorological Observers," by Mr. W. Marriott. This useful little work, consisting of only sixty pages, of which twenty pages are tables of reduction, contains all that is necessary for the purpose for which it is intended, and, what we think is of much importance, nothing that is not necessary. Among the chief additions to this new issue are instructions for the construction of thermometer screens for tropical countries, a description of Mr. Dines's pressure tube anemometers, which are likely to come into more general use, and pictures to accompany the cloud nomenclature adopted by the International Meteorological Committee. The Meteorological Congress held at Rome in 1879 expressed the opinion that an international dictionary of meteorology should be published, and as a first step towards the carrying out of this resolution a "Glossary of Meteorological Terms" has been added, which will be of considerable assistance, especially to younger observers.

THE annual report issued by Mr. J. B. Carruthers, Government mycologist at the Royal Botanic Gardens, Ceylon, records important work completed or in progress. Of fungal diseases, those which attack the tea plant naturally receive the most attention. The most important of the leaf diseases, known as grey blight and caused by *Pestalotzia Guepini*, seems to be confined to the tea shrub, as it has not been found on the leaves of plants growing in the jungle or elsewhere in the vicinity of diseased tea plants. Experiments are being carried on to determine how far the disease may be carried by spores, and the liability of weak plants to succumb to the disease. The discovery of the ascus-bearing fruit on the stem reveals a method by which the fungus can perpetuate itself. Under ordinary circumstances it is confined to the leaf, but if it can attain a vigorous state of development it may grow down the leaf-stalk into the stem and there form its fruit. A destructive root disease is due to *Rosellinia radiciperda*, a fungus which can grow both as a saprophyte and as a parasite. It starts on dead timber, such as the root-tissues of a dead Symplocos, and when the soil is thoroughly wet it can travel and spread to the roots of living plants, notably the tea plant. An effectual remedy consists in cutting deep drains at least a foot broad. Other subjects investigated were cacao canker, finger and toe disease, dry rot and pollination of cacao flowers.

THE *Journal* of the Anthropological Institute is highly creditable both to the Institute and to Britain; it is, as a matter of fact, the best extant journal that deals with anthropology in a comprehensive manner, and it is to be regretted that it does not meet with the circulation that is deserved by its interest and value. The range of the second part of vol. xxxi. extends from Wiltshire palaeoliths and Irish copper celts to notes on Malay metal work and a classification of Sarawak swords; there are papers on African and Papuan craniology, trephining in Melanesia, colour vision of the natives of Upper Egypt, early Egyptian racial types, an ethnographical account of the natives of Manipur and of the Paraguayan Chaco, the animal cults of Sarawak, and a memorandum on the languages of the Philippines. Several of these articles are fully illustrated with most excellent plates, and it will be noticed that practically the whole range of anthropology is covered by original articles in the current number of the *Journal*.

IT has long been suspected that certain prehistoric peoples trephined the skull of living persons for surgical reasons, and now we have a definite modern instance from Melanesia. The Rev. J. A. Crump, in his paper on "Trephining in the South Seas"

(*Journal of the Anthropological Institute*, vol. xxxi. p. 167), states that in New Britain the local wizard trephines with a piece of shell or with a flake of obsidian in cases of fracture caused by a sling stone. This operation is described; the number of deaths is about 20 per cent., most of these resulting from the first injury and not from any complication after the operation. Complete recovery takes place in two or three weeks' time. In New Ireland the operation is performed, not only in the case of fracture, but where there is epilepsy and certain forms of insanity as the result of pressure on the brain. After trephining has been performed, there is frequent partial temporary paralysis, which almost invariably passes away. Idiocy is an occasional result also. But the natives affirm that while the cures of insanity and epilepsy are many, the instances where either malady supervenes after the operation are exceedingly few. Dr. Victor Horsley's discussion of this paper lends it additional interest.

ONE of the latest departures of the experimental psychologist consists in prodding people with a pointed instrument when they are asleep to find out how much excitation is required before they begin to move, and how much it takes to wake them up. This method is embodied in a paper on "Experimental Investigations on the Depth of Sleep," by Drs. Sante de Sanctis and U. Neyroz, of Rome, a translation of which is given in the *Psychological Review* for May. The instrument employed is called a Griessbach ethesiometer (made by Brändli, of Basle), and may be used with either a sharp or blunt point. It measures the stimulus necessary to induce subconscious reaction, and that applied at the waking point. Four normal subjects, all relatives of the writer of the paper, were experimented on for about six consecutive months, and afterwards five subjects, mostly epileptic, were operated on, and from the results obtained curves were drawn showing the relative depth of sleep, as measured by the stimuli required, after the subject had been allowed to sleep for various lengths of time. The curves are all of zigzag form, and the experiments may perhaps suggest a practical application in the case of subjects who find it hard to wake in the morning, and who may overcome the difficulty by timing their sleep so that the waking point is at a minimum when they wish to rise.

IN the Report of the Marlborough College Natural History Society for 1901, Mr. S. B. Dixon gives an account of the recent important discovery of Palæolithic flint implements at Knowle, near Savernake Forest. The state of the Society appears to be flourishing, the entomological section showing a specially good record of work. The report is illustrated by some excellent reproductions from photographs of local scenery.

ACCORDING to the Berlin correspondent of the *Times*, an international agreement for the protection of birds useful to agriculture was signed at Paris on March 19, the contracting parties being Belgium, France, Greece, Lichtenstein, Luxemburg, Monaco, Austria-Hungary, Portugal, Sweden, Switzerland and Spain. Certain insectivorous species and others scheduled as being specially useful to agriculture are to receive unconditional protection, the destruction of the birds themselves, or of their nests and eggs, being prohibited at all seasons. It is noticeable that Italy, where numbers of useful birds are annually killed during migration, does not appear among the signatories.

IN the introductory comments to the second (May) number of the *Field Naturalist's Quarterly*, the editor discusses the proper sphere of work for local natural history societies. The importance of taking cognisance of all subjects connected with local biology is strongly urged, as the specialists are sure to look after their own interests, and will, when necessary, institute sections devoted to their own favourite subjects. "The great justification of a field club ought to be that it is doing

work that is otherwise neglected. There is not an area of ten miles square in this country but what offers some subject of investigation." Several of the articles in this number deal with the habits and movements of animals in spring, and the illustrations include some interesting photographs of nests and eggs.

WE have received the "Catalogue of the Educational Collection of Minerals belonging to the West Ham Municipal Technical Institute," compiled by Dr. H. A. Auden. From a high scientific standpoint the classification here adopted of minerals, according to electronegative constituents, will no doubt meet with the approval of the learned. Under this arrangement, zincite, corundum and hæmatite (as simple oxides) follow one another; and the same is the case with anhydrous carbonates, such as aragonite, witherite, strontianite and cerussite. For purposes of technical education a practical grouping would appear more desirable. The author's object is, however, to illustrate the systematic grouping of mineral specimens, and in the "addenda" he enumerates the principal metals and ores, jewels and other minerals of industrial importance. An index would have added to the value of this useful work.

A NEW general method for the synthesis of fatty aldehydes is described by MM. L. Bouveault and A. Wahl in the current number of the *Comptes rendus*. It was shown by Henry some time since that aldehydes of the fatty series could be readily condensed with nitromethane to form addition products, which the authors have now found to readily lose water to zinc chloride under suitable conditions, giving nitro-derivatives of substituted ethylenes. These are readily reduced by zinc and acetic acid to oximes, from which the aldehyde can be obtained without difficulty. The method has been applied by MM. Bouveault and Wahl to the synthesis of isobutylacetic aldehyde from the product of condensation of isovaleral with nitromethane, and of caprylic aldehyde from cenanthol.

SINCE the discovery of the remarkable compound of hydrogen and nitrogen known as hydrazoic acid, numerous modes of preparing it have been worked out, mostly through the use of somewhat complicated organic compounds. The only purely inorganic syntheses of this acid are those of Wislicenus from sodium amide and nitrous oxide and of Tanatar from hydrazine and nitrogen chloride. Tanatar now describes in the current number of the *Berichte* another elegant synthesis of this compound. A mixture of hydrazine sulphate and hydroxylamine hydrochloride is treated in acid solution with an oxidising agent and distilled, when hydrazoic acid passes over with the distillate. Hydrogen peroxide and chromic acid appear to give the best yields, which in no case exceed 30 per cent. of the theoretical amounts. Dihydroxylamine is probably the first product of oxidation, which then condenses with the hydrazine and is further oxidised to N_3H .

DR. M. BIAL has recently carried out some interesting experiments on the antiseptic properties of dilute solutions of acids, details of which are given in the last number of the *Zeitschrift für physikalische Chemie*. The observations were carried out with yeast cells, measurements of the retarding action of different acids on the development of the cells being made by observing the amount of carbon dioxide liberated from a solution of grape sugar. It is found that the concentrations of the solutions, which are just sufficient to check completely the development of the cells, are much smaller in the case of the strong acids like hydrochloric and sulphuric acids than in the case of weak acids such as acetic and butyric acids. The results, in fact, lead the author to conclude that the antiseptic power is essentially determined by the hydrogen ion which is contained in the acid solutions, and the electrolytic dissociation theory is able

to account for the observed phenomena in a satisfactory manner. As is required by this theory it is found that the addition of neutral acetates to a solution of acetic acid diminishes the anti-septic power of the acid, the concentration of the active component of the solution, the hydrogen ion, being under these circumstances reduced to a much smaller value.

NUMEROUS theories have been put forward at different times to account for the formation of natural paraffins, the one received with most favour being that due to Berthelot and developed by Mendeléeff in which the action of steam upon metallic carbides was regarded as the main source of the hydrocarbons. The chief stumbling block to this view was the difficulty of explaining the mode of formation of the naphthenes of the Russian oilfields. The researches of MM. Paul Sabatier and J. B. Senderens on the action of reduced nickel, iron and other metals upon hydrocarbons have now placed the "chemical" theory of petroleum formation on a firm experimental basis. By the direct hydrogenation of acetylene in the presence of nickel they have obtained liquid mixtures of hydrocarbons which can be made to correspond either with American or Caucasian petroleum by varying the conditions of the experiment. To account for the formation of petroleum it is thus sufficient to admit that there are in the depths of the earth free alkali metals and metallic carbides, which in contact with water give rise to mixtures of hydrogen and hydrocarbons. These gases encounter nickel, cobalt or iron in a finely divided state, and thus give rise to the mixtures of hydrocarbons forming natural petroleum.

THE additions to the Zoological Society's Gardens during the past week include a Bosman's Potto (*Perodicticus potto*) from West Africa, presented by Mr. Edward Straw; three American Bisons (*Bison americanus*) from North America, presented by H.G. the Duke of Bedford, K.G., P.Z.S.; three Darwin's Rheas (*Rhea darwini*) from Patagonia, a Red Ground Dove (*Geotrygon montana*) from South America, presented by Capt. John L. Marx, R.N.; two Garden's Night Herons (*Nycticorax gardeni*) from the Falkland Islands, presented by Mr. W. Grey Wilson, C.M.G.; an Algerian Tortoise (*Testudo ibera*) from North Africa, presented by Master C. Treverlyn Gill; a Silvery Gibbon (*Hylobates leuciscus*) from Java, deposited; six Ruddy Flamingoes (*Phoenicopterus ruber*) from North America, twenty Alpine Newts (*Molge alpestris*), twenty Newts (*Molge montandonii*) from Roumania, purchased; a Thar (*Hemitragus jemlaica*) born in the Gardens.

THE EQUATORIAL CURRENT ON JUPITER.

THAT differences occurred in the rate of motion of different markings on Jupiter was first discovered by Cassini in the seventeenth century. But other observers in later years appear to have neglected the systematic study of the planet. His disc was occasionally surveyed, it is true, and the positions of the belts described, but the details were not perseveringly followed. Telescopes were formerly of inordinate length and not very effective in performance, but what was accomplished by Cassini might also have been achieved by others. Jupiter's dimensions are such that comparatively small and imperfect instruments are capable of revealing the principal markings. Herschel never made a thorough investigation of the Jovian spots, though he obtained some observations in 1779 and recognised the difference in their motions. Until the last half of the nineteenth century the planet seems to have been generally surveyed in a desultory manner.

The apparition of the great red spot, however, revolutionised the existing state of things, for it was destined, not only to attract an immense amount of attention to itself, but to the whole visible phenomena presented by the surface markings of Jupiter. When this remarkable object first became perceptible it is not our purpose to inquire; it is certain, however, that as an exception-

ally conspicuous feature it was widely observed during the last half of 1878.

It was long thought that the equatorial region of the planet supplied us with the most swiftly moving objects. This was, however, found to be a mistaken impression. The white and dark equatorial spots completed a rotation in about $5\frac{1}{2}$ minutes less time than the red spot, and this meant a difference of velocity amounting to about 250 miles per hour. But it was soon seen that though the equatorial current is much more rapid than the rate exhibited in certain other latitudes, it does not equal the velocity of some other occasional markings in the northern hemisphere.

It is only our intention, however, to refer briefly to the equatorial markings observed during the last quarter of a century. But it must be confessed that the observations are not nearly so continuous and complete as the importance of the subject demands. The results have been sufficiently full for all purposes during the last few years, for several observers, including Mr. A. S. Williams, Rev. T. E. R. Phillips, Captain P. B. Molesworth and others, have obtained a mass of useful materials with reference to the equatorial current. And there seems no doubt that the investigation will be adequately maintained. It is chiefly to the continuity of the observations that we must look for the satisfactory elucidation of the phenomena presented. The equatorial spots have not, it is true, been always in strong evidence. In certain years they are liable to be almost, if not entirely, absent. The breaks, therefore, which occur amongst the accumulated observations are not always to be ascribed to negligence on the part of Jovian students.

At present the equatorial spots are both numerous and conspicuous, and it is to be hoped that a large addition to our observations will be effected during this opposition. The results for preceding years are very extensive and exhibit an irregular, though on the whole a decided, increase in the rotation period, but it would be premature to undertake the collection and reduction of all the materials. The observations must be prolonged over a much more lengthy interval before they can be expected to reveal the information we require. As observed at Bristol, the equatorial spots have shown the following variations in their rotation period, but satisfactory mean results from a number of different objects were only obtained during the last four oppositions:—

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|------|-----|----|----|------|------------------------|
| 1880 | ... | 9 | 50 | 5.8 | ... 1 very bright spot |
| 1881 | ... | 9 | 50 | 8.8 | ... " " |
| 1882 | ... | 9 | 50 | 11.4 | ... " " |
| 1883 | ... | 9 | 50 | 12.1 | ... " " |
| 1885 | ... | 9 | 50 | 14.3 | ... " " |
| 1886 | ... | 9 | 50 | 22.8 | ... " " |
| 1895 | ... | 9 | 50 | 34.3 | ... 2 black spots |
| 1898 | ... | 9 | 50 | 23.6 | ... 23 spots |
| 1899 | ... | 9 | 50 | 24.6 | ... 27 " |
| 1900 | ... | 9 | 50 | 24.1 | ... 18 " |
| 1901 | ... | 9 | 50 | 29.1 | ... 28 " |

W. F. DENNING.

GERMAN PROGRESS IN OPTICAL WORK.¹

I PURPOSE dealing with statistics compiled from information afforded me by two German firms and one Austrian, Messrs. Zeiss, Leitz and Reichert respectively, all of whom are well-known makers of microscopes, and the first named of many other optical instruments, including prismatic field glasses, of which, as is well known to you all, they were the originators. I must say that the figures quoted refer approximately to the end of the year 1899, since which date the average rate of increase has been more than maintained. Taking first the firm of Zeiss, in Jena, twenty years ago they employed fifty men; five years later the number had leaped up to 170, or more than three times as many; in another five years the number had practically been doubled, 327 being the precise number; yet another five years saw the number 580; while to-day (1899) they employ the astonishing number (astonishing, that is, for the class of instruments they manufacture) of 946 men, this grand total being made up as follows: theoretical staff, 22; office and dispatch, 36; mechanics, 322; opticians, 371; wood-workers, leather-

¹ Abridged report of a paper entitled "The Secret of German Progress," read before the Optical Society by Mr. Herbert F. Angus, Hon. Sec. of the Educational Committee of the Society.